



# Epidemiologic Update: Hepatitis C

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# Hepatitis C Virus Infection

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- Clinical entity (non-A, non-B hepatitis) in transfused patients reported late 1960s
- RNA Flavivirus (Hepacivirus)
  - Discovered using recombinant DNA technology 1989
- Bloodborne (primarily) and sexually-transmitted
- Vaccine difficult to develop
  - Mutations occur during viral replication
  - Substantial heterogeneity (quasispecies) selects for neutralization escape variants

# HCV Accomplishments During Past 15 Years

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- Determined burden of infection and morbidity in the general population
- Eliminated transfusion-associated infections
- Characterized the epidemiology
- Documented >80% decline in incidence
- Implemented community-based prevention
  - Slowed rates of infection in new IDUs
- Vaccine developed that may prevent chronic infection (subtype specific)
- Tissue culture systems effective for growing infectious virus
  - May speed development of new antivirals

# Hepatitis C Virus Infection, United States

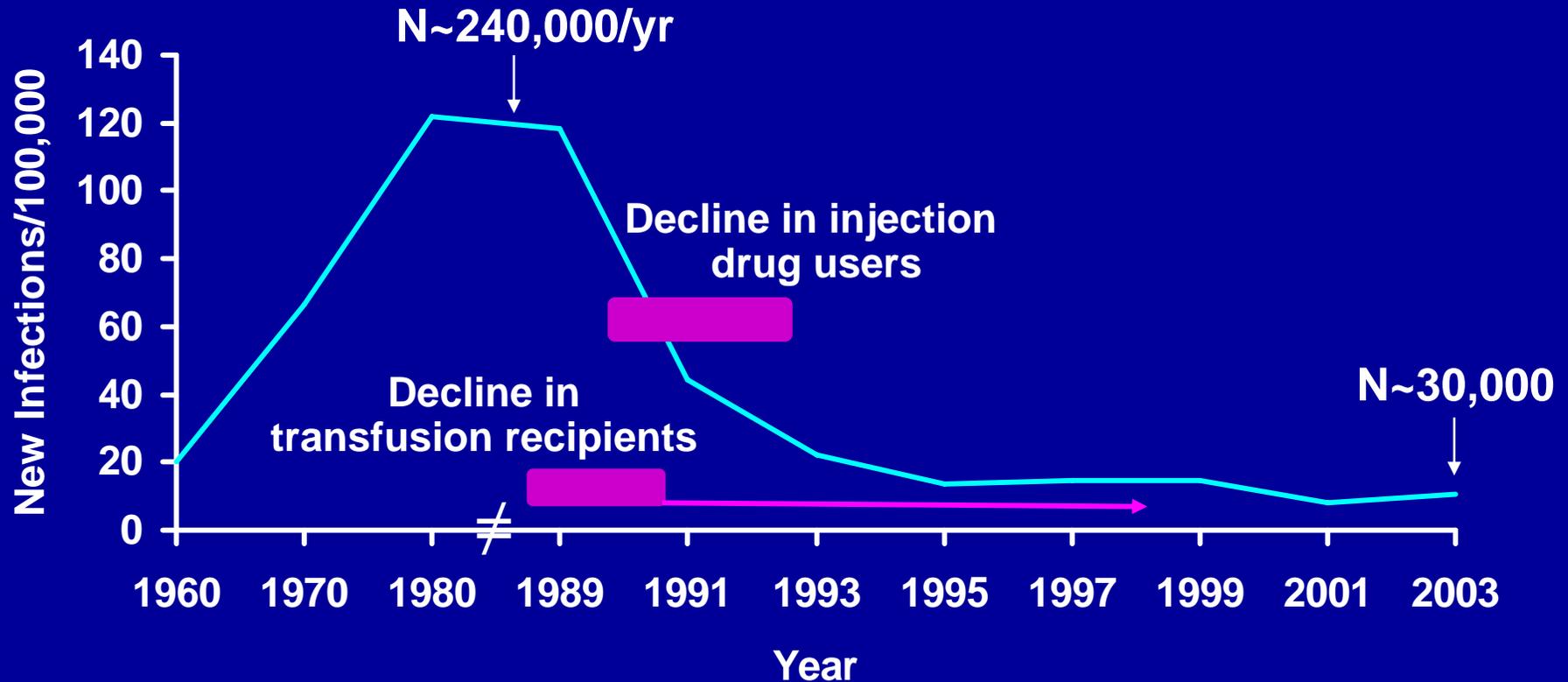
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New infections per year 1985-89	242,000
2003	30,000
Persons ever infected (1.6%)	4.1 million (3.4-4.9)*
Persons with chronic infection	3.1 million (2.5-3.7)*
HCV-positives tested	~40%
Persons with HIV co-infection	~225,000

\* 95% confidence interval (data from NHANES 1999-2002)



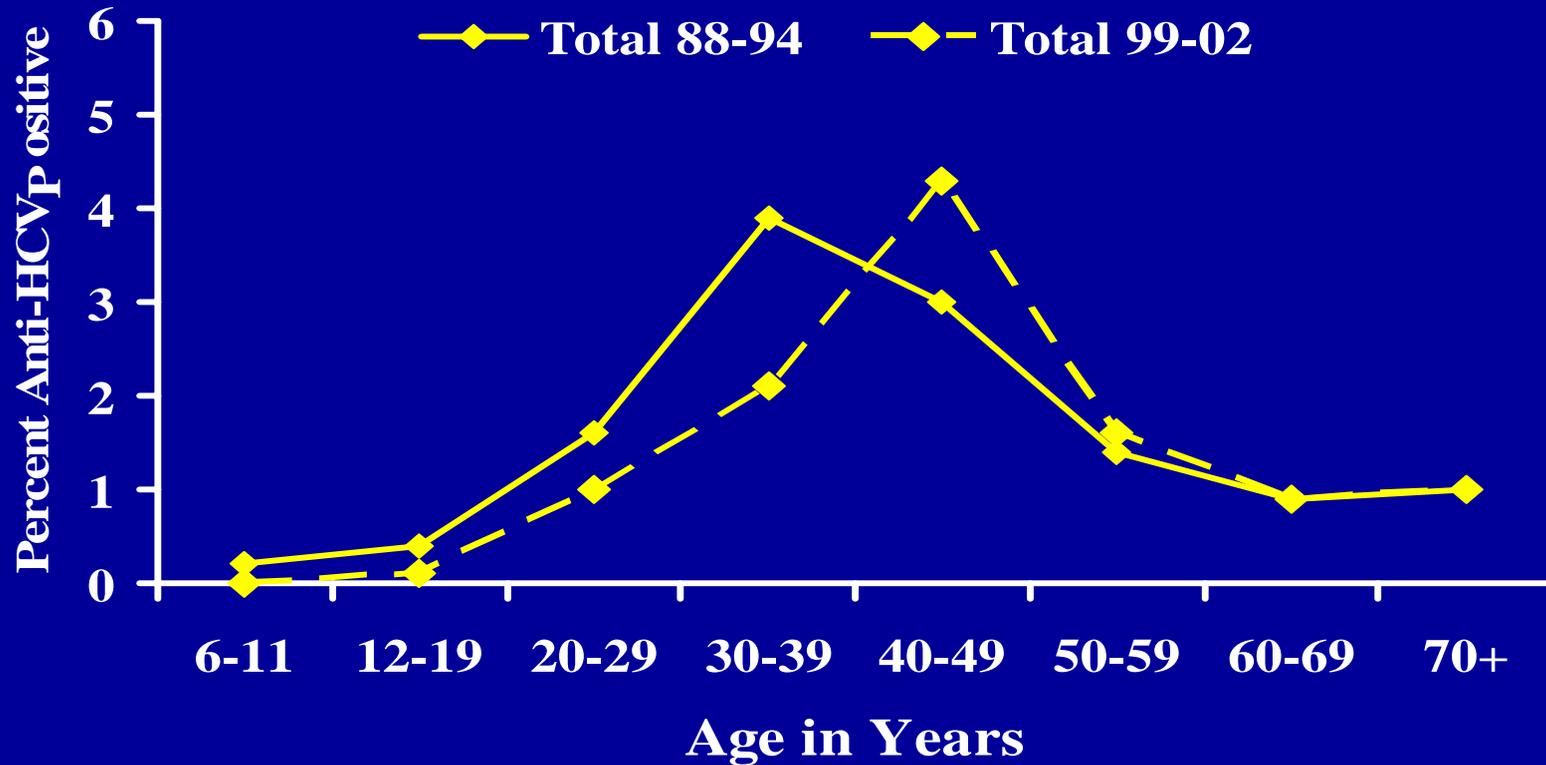
# Estimated Incidence of Acute HCV, U.S.



Source: Armstrong GL. Hepatology 2000;31:777-82;  
Alter MJ. Hepatology 1997;26:62S-65S; CDC, unpublished data



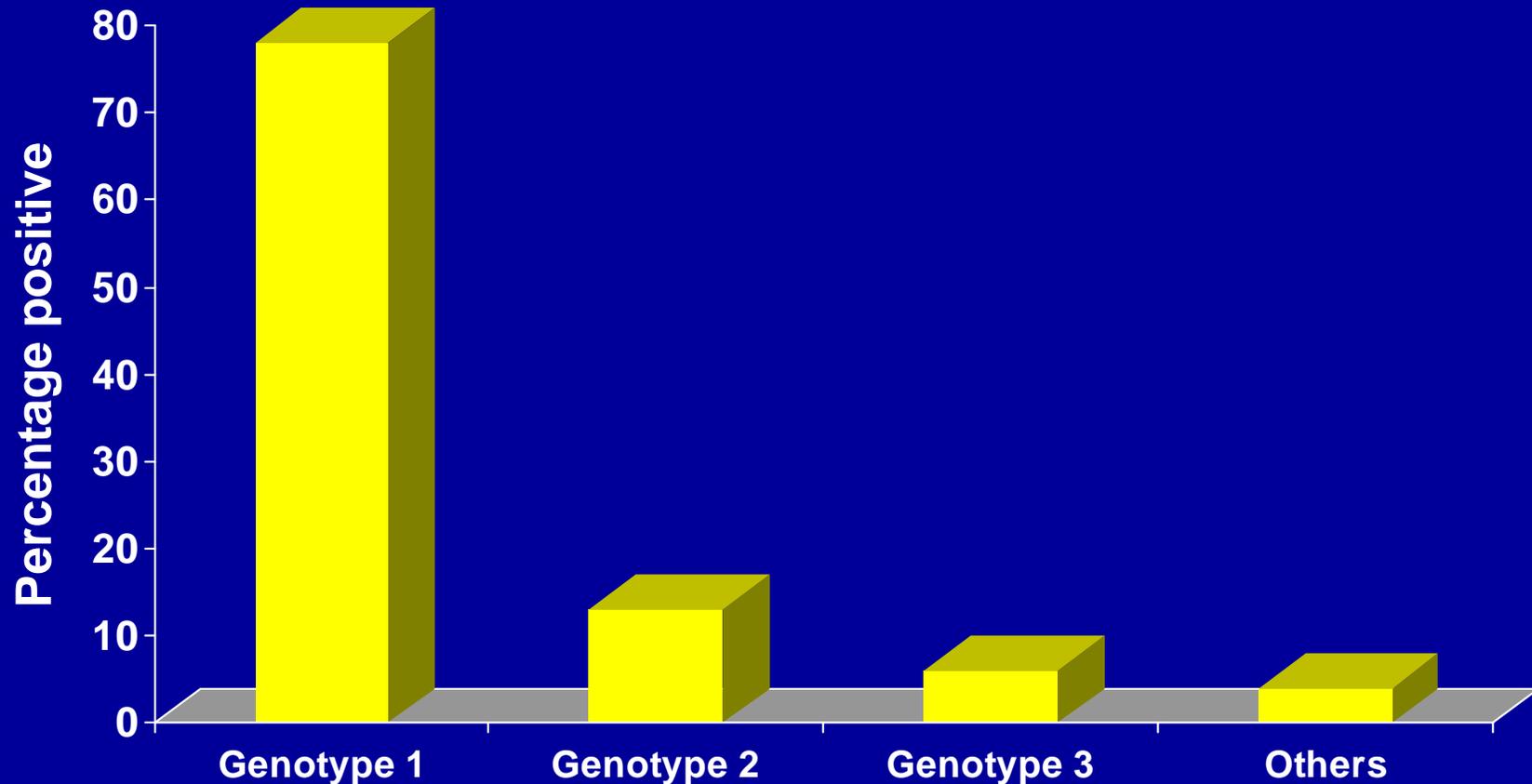
# Prevalence of HCV Infection in the General Population by Age, U.S., 1988-2002



Source: NHANES: Alter MJ, NEJM 1999;341:556-562;  
Armstrong GL, Ann Intern Med 2006, in press



# Distribution of HCV Genotypes in the US General Population, NHANES, 1988-1994



Nainan et al. Gastroenterology 2006, in press



# Risk Factors Associated With Acquiring HCV Infection

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- Transfusion, transplant from infectious donor
- Injecting drug use
- Occupational blood exposure (needle sticks)
- Birth to an infected mother
- Infected sex partner
- Multiple heterosexual partners

# Outbreaks of HCV Infections Clustered in Time and Place

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- **Health-care related transmission**
  - In- and outpatient care, long-term dialysis
  - Most due to unsafe injection practices
    - Finger stick devices, multi-dose medication vials, reuse of syringes/needles for anesthesia, pain management, saline flushes
- **Sexual transmission among HIV-pos. MSM**
  - Reported from France and UK

# Relative Efficiency of HBV, HCV, HIV Transmission by Type of Exposure

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<u>Type of exposure to infected source</u>	Efficiency of transmission		
	<u>HBV</u>	<u>HCV</u>	<u>HIV</u>
Transfusion	++++	++++	++++
Injecting drug use	++++	++++	++++
Unsafe injections	+++	+++	+
Needlestick	+++	+	<+
Sexual	+++	+	+++
Perinatal	++++	++	+++
Non-intact skin	++	+/-	+/-
Intact skin	-	-	-

# Relative Infectivity of HBV, HCV, HIV

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	<u>HBV</u>	<u>HCV</u>	<u>HIV</u>
Copies/mL	$10^{8-9}$	$10^5$	$10^3$
Environmental stability	++++	++	-
Infectious after drying at room temperature	$\geq 7$ days	$\geq 16$ h	0

Sources: Bond Lancet 1981; Krawczynski Hepatology 2003

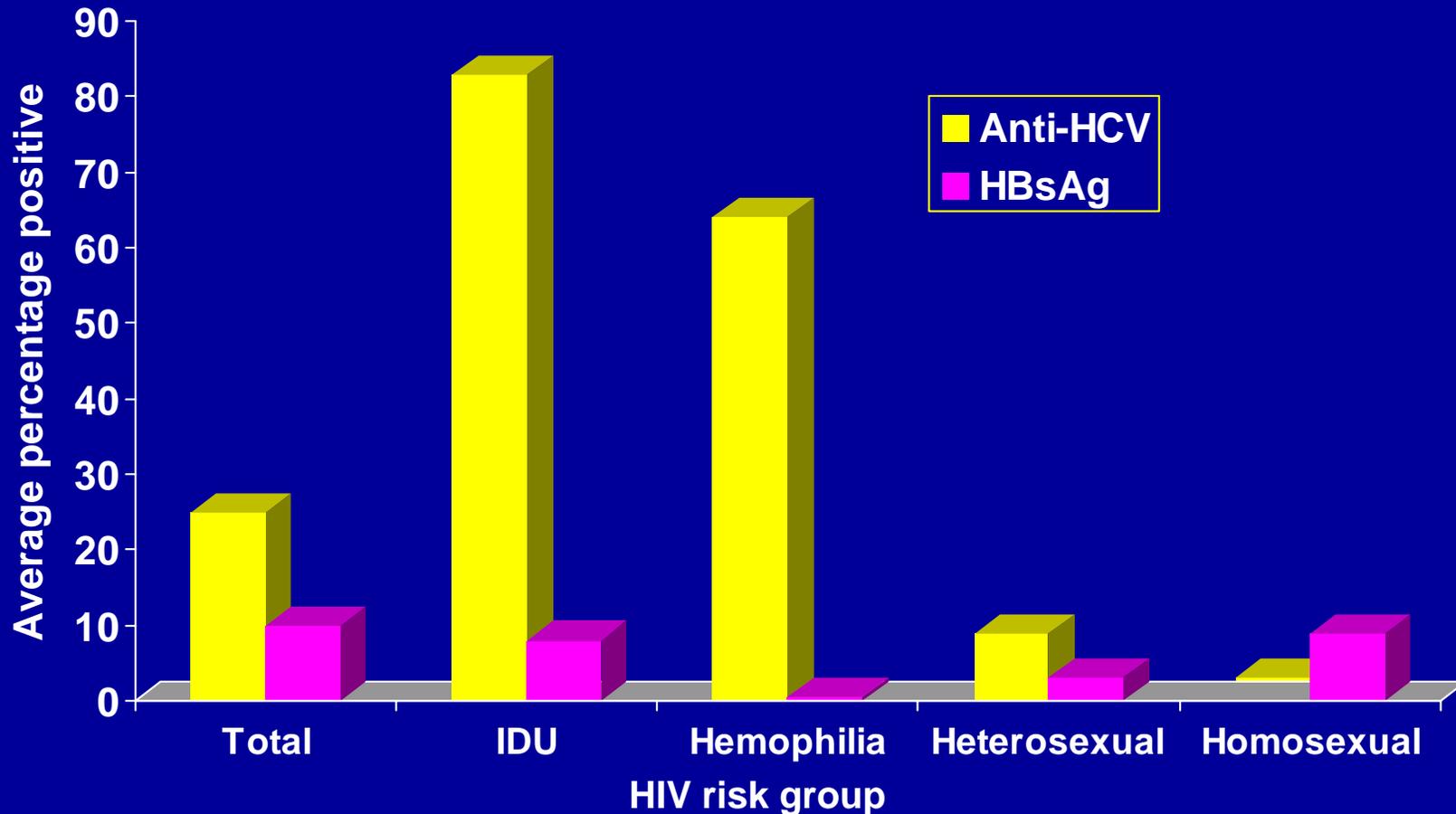


# Effect of Environmental Stability on Transmission of HCV and HBV

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- More rapid acquisition among IDUs
  - Associated with sharing drug preparation equipment (i.e., cookers and cotton)
  - Clean needles and syringes insufficient to interrupt transmission
- Facilitates iatrogenic transmission
  - Patient-to-patient from contaminated multi-dose vials, reused needles and syringes

# Prevalence of Chronic HBV and HCV in HIV Positives by HIV Risk Group



Denis F, Pathol Biol 1997; Thio CL, Lancet 2002; Sherman K, CID 2002, Kellerman S JID 2003; Konopnicki D, AIDS 2005



# Exposures Not Associated With Acquiring HCV

## Case Control Studies of Acute Hepatitis C, U.S., 1979-85

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<u>Exposure (prior 6 months)</u>	<u>Cases n=148</u>	<u>Controls n=200</u>
Medical care procedures	30.4%	29.5%
Dental work	24.3%	23.5%
Health care work (no blood contact)	4.1%	5.0%
Ear piercing	2.7%	3.0%
Tattooing	0.7%	0.5%
Acupuncture	0	1.0%

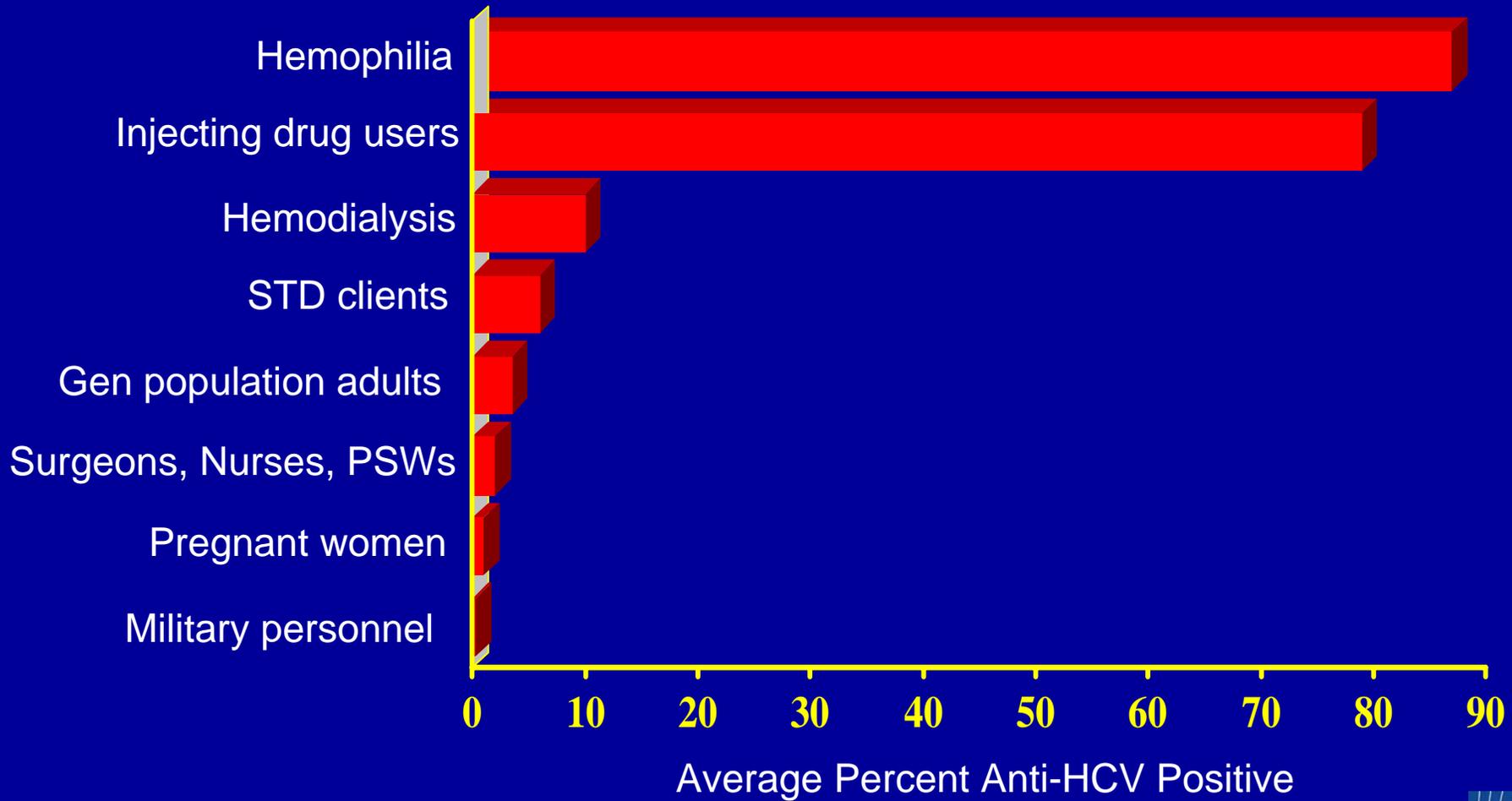
Sources: JID 1982;145:886-93; JAMA 1989;262:1201-5.



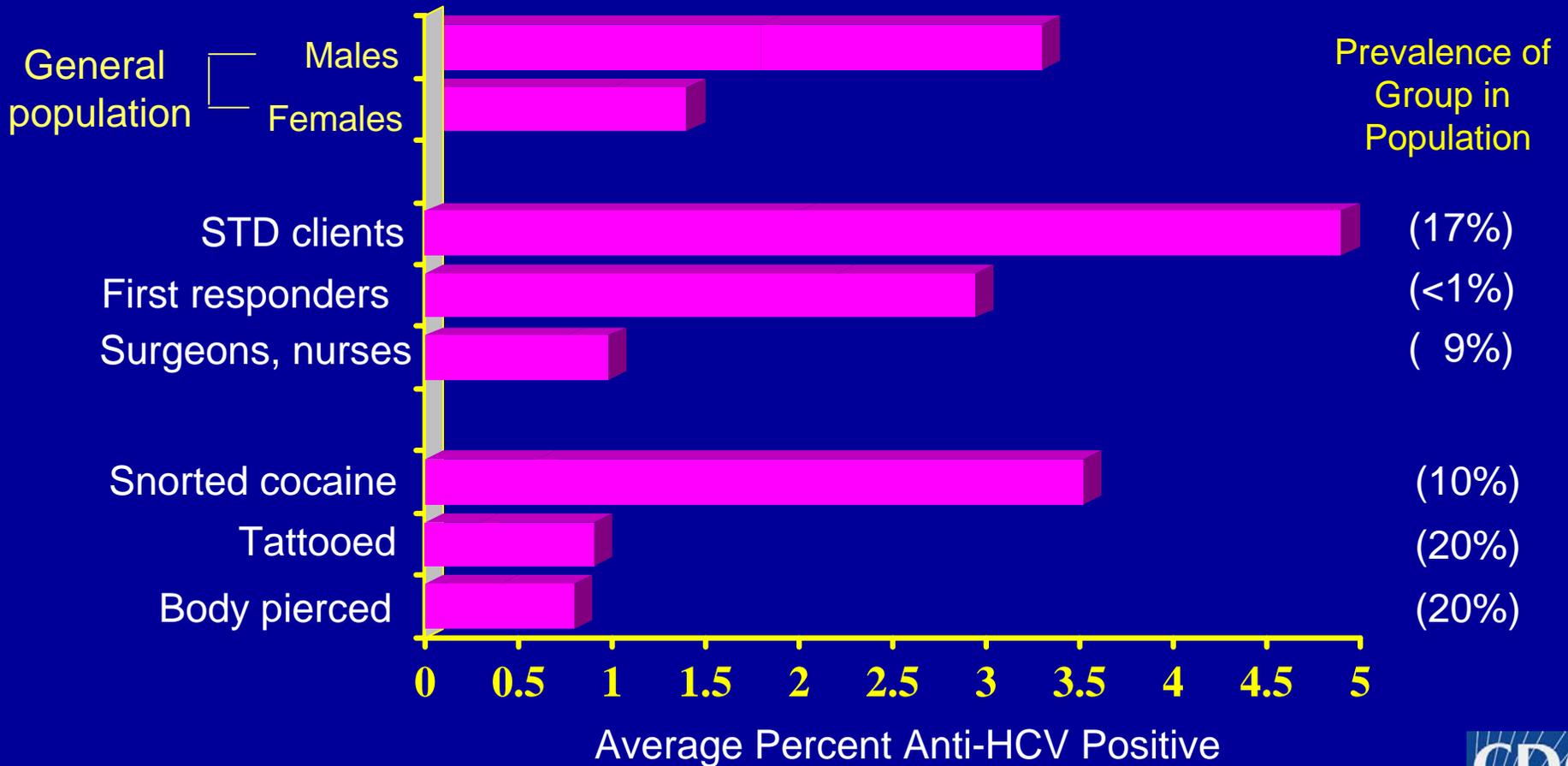
Presence of a Risk Factor  
Does Not Necessarily Equate  
With  
“Increased Risk”



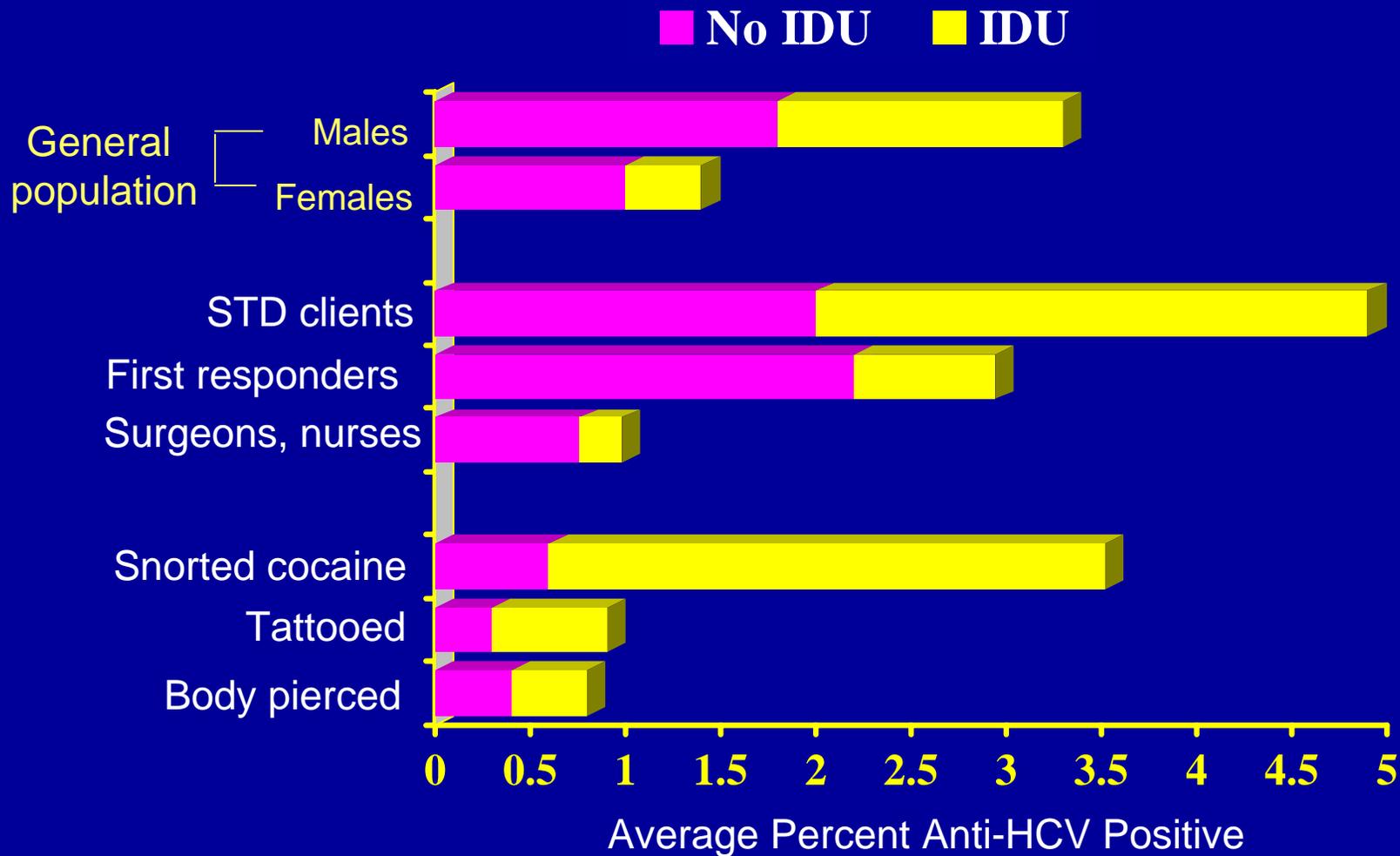
# HCV Prevalence by Selected Groups United States



# HCV Prevalence in Selected Groups of Adults United States



# HCV Prevalence in Selected Groups of Adults by History of Injection Drug Use, United States



# Screening for IDU Efficiently Identifies Most HCV-Positives

<u>Setting and Criteria</u>	<u>Screened</u>	<u>HCV Pos</u>
STD clients	3356	165 (5%)
IDU, transfusion <1992	12%	70%
Incoming prison inmates	1148	152 (13%)
IDU	11%	61%
IDU, hx liver disease	13%	70%
General population 20-59 years old		
IDU, transfusion <1992	7%	53%
IDU, transfusion <1992, abnl ALT	18%	85%

Source: Gunn RA, Sex Transm Dis 2003; D Burnett, Wisconsin; Armstrong GL, Annals 2006.



# Progress in HCV Prevention and Control Among Injecting Drug Users

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- Cumulative infection rates have slowed
  - 30% prevalence after 2-3 years
- Harm reduction messages more HCV-specific
  - All drug paraphernalia, not just needles/syringes
- Incidence still remains high
  - 15% annual rate
  - Accounts for 60-70% of all new infections